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Characterising and comparing animal-health services in the Rift Valley, Kenya: An exploratory analysis (Part I)

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Abstract

Livestock are of vital importance to the livelihoods of millions of people across the world, playing a pivotal role in income-generation, employment, food security, transport and social cohesion. Access to quality animal-health services by livestock owners is critical to sustainable food-animal production; therefore animal-health practitioners represent key stakeholders within the world food system. A mixed-methods study was conducted in the Rift Valley of Kenya to characterise and compare existing private animal-health services, and to explore perceptions of veterinary services amongst pastoralists and farmers. Forty structured questionnaires were administered to staff at animal-health outlets, including franchise outlets of 'Sidai Africa Ltd', and two focus group discussions were facilitated to explore the perceptions of a Maasai pastoralist group and members of a dairy-farmer cooperative of their local animal-health services. Results were analysed using descriptive methods and the confidence interval overlap technique. Differences were detected in the

characteristics of Sidai outlets, agrovets (agricultural retailers), pharmacies and dukas (general shops). Sidai outlets offered a more professional and diverse portfolio of livestock services. Across all outlet types, staff knowledge and training gaps and a shortage of cold-chain facilities were identified. Farmers have strong preferences for certain products, which may foster the development of drug resistance. There is a disconnection between the sale of veterinary medicines and the provision of quality advice, with many agrovets, pharmacies and dukas selling veterinary medicines but lacking the capacity to provide clinical services. There is a clear demand from livestock-keepers for accessible, affordable and quality animal-health services and products in Kenya; therefore animal-health practitioners have the potential to provide increased support to livestock-based livelihoods.

Keywords

Livestock; animal-health; service delivery; veterinary medicine; drugs; pastoralists.

1. Introduction

Domestic animals are of vital importance to the livelihoods and well-being of one billion of the world's poor (LID, 1999). Livestock are a uniquely multifunctional capital asset, representing a source of income, nutrition, employment, transport, draught power and social cohesion to communities (LID, 1999). However, animal production is constrained by a number of challenges across the world, including disease burdens that compromise livestock health, welfare, productivity and international trade opportunities (LID, 1999; AU-IBAR, 2010). In many developing countries, infectious diseases and inadequate access to quality veterinary services (LID, 1999; AU-IBAR, 2010; FAO, 2013) prohibit livestock keepers from making necessary investments in animal-health services (FAO, 2013). Animal diseases are responsible for annual losses of over four billion US dollars in sub-Saharan Africa, amounting to a quarter of the total value of livestock production in the region (AU-IBAR, 2010). Fundamental livestock inputs include quality feed, water and animal-health

services, the latter of which has been described by Swanepoel *et al.* (2010) as a “*critical production constraint*” in food supply chains. Veterinary activities make vital contributions to all stages of livestock production from ‘farm to fork’ by reducing animal-disease and public-health risks, improving levels of production and attaining food quality and safety standards. As such, animal-health practitioners are key stakeholders within the world food system (Bonnet *et al.*, 2011).

The provision of veterinary services in Kenya, and in many other countries in sub-Saharan Africa, has evolved significantly over recent decades. Animal-health services and products are currently provided in Kenya by veterinary surgeons, animal-health assistants (paraprofessionals), community animal-health workers, shop and market vendors, ethnoveterinary practitioners and natural healers (Heffernan and Misturelli, 2002; Young *et al.*, 2003). These practitioners all play an important role in the provision of veterinary services, albeit with variable levels of availability, accessibility, affordability, acceptability, quality (Campbell *et al.*, 2013; Leyland *et al.* 2014) and legal status (National Council for Law Reporting, 2012). Many private purveyors of veterinary products operate from ‘agrovet’ premises across the country (Bett *et al.*, 2004). ‘Agrovet’ shops are retailers of mixed agricultural supplies, the majority of which are privately owned, with some operating as franchises of ‘Sidai Africa Ltd’. Sidai Africa Ltd is a social enterprise consisting of a franchise network of livestock service centres across Kenya, providing animal-health products and technical advice to farmers and pastoralists (Sidai, 2016). Sidai also owns a number of livestock centre ‘hubs’, providing services and distributing drugs to agrovet in their region. For the purpose of this study, the term ‘agrovet’ is reserved for *non-Sidai* agrovet, and ‘Sidai outlet’ is used to describe all Sidai franchises and hubs. There is usually a maximum of one Sidai outlet in each village. Other retailers of veterinary medicines include private mixed pharmacies, also selling human drugs, and shops known as ‘dukas’, selling a large range of household products. Market vendors also retail veterinary medicines in many towns from informal stalls, but these were excluded from the scope of this study.

Building upon previous work by Bett *et al.* (2004), this study characterises and compares animal-health outlets in terms of their facilities, services and workforces. This study is the first of a two-part study, with Part II describing the knowledge, attitudes and practices of animal-health outlet staff in dispensing drugs in the study area.

2. Materials and methods

2.1 The study area

A mixed-methods study (Bardosh *et al.*, 2013) was conducted in 23 towns and villages in seven counties of the Rift Valley of Kenya, between latitudes 1.60°S and 0.88°N and longitudes 34.81°E and 36.33°E. The study area was selected to represent a variety of agro-ecological zones from the

semi-arid grasslands in Narok and Nakuru counties with prevailing Maasai pastoral systems, to Kericho and Bomet counties with mixed smallholder systems in high-potential areas around the tea plantations, and the medium-potential counties of Uasin Gishu, Butere and Nandi, which support smallholder farming and dairy systems. See Figure 1.

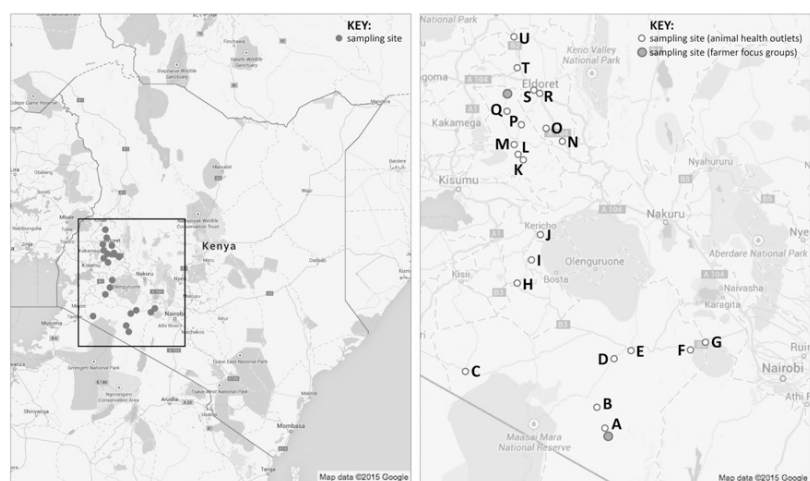


Figure 1: Maps of the study area in the Rift Valley of Kenya. The map on the right highlights the 21 towns and villages sampled for the animal-health outlet survey, labelled A to U, and the two sites of the farmer focus group discussions. (Google™ maps, 2015)

2.2 Survey of animal-health outlets

2.2.1 Criteria, sampling method and classification of animal-health outlets

Within the study area, ‘animal-health outlets’ were the units sampled for inclusion in the study. For the purpose of this study, animal-health outlets were defined as fixed premises (permanent shops) selling veterinary medicines. Additional criteria included (a.) premises being open at the time of the interviewers’ visit, and (b.) presence of an available staff member who was willing to anonymously participate in the study with managerial consent.

The sampling sites and the animal-health outlets were systematically sampled in the absence of a sampling frame. Selection of sampling sites was based on the presence of a Sidai outlet in the locale, facilitating the sampling of approximately equal numbers of Sidai outlets (n=16) and agrovets (n=18) in corresponding areas. ‘Other’ outlets, consisting of pharmacies and dukas selling veterinary medicines (n=6), were also sampled when available and identifiable. For the purpose of this study, due to the small sample size for these categories of animal-health outlets, pharmacies and dukas were evaluated as a single group, termed ‘other’ outlets. Within each sampling site, between one and four animal-health outlets were sampled, to achieve the target quota of 40 animal-health outlets.

2.2.2 Survey administration

A total of 40 animal-health outlets were sampled for an interview survey over a two-week period in January and February 2015. The interviews were administered in-person as a structured questionnaire in Swahili by the second and third authors.

2.2.1 Questionnaire design

The questionnaire included variables relating to the type of outlet, the outlet's facilities, services and sales, and the outlet's workforce, training and perceived constraints. The outlet type was designated as an explanatory variable to determine its effect on the quality and capacity of the animal-health outlet (OIE, 2014b). Variables relating to facilities, services and workforce were selected as response variables, to represent indicators of the quality and capacity of the animal-health outlet (Table 1). In the delivery of the questionnaire, a variety of closed and open questions were employed (Bryman, 2015). The questionnaire was piloted on three respondents on 26th January in Narok and was revised to ensure clarity and feasibility.

Table 1: Variables explored in the animal-health outlet staff questionnaire. The type of variable is ticked where the confidence interval overlap technique was used; all other variables were subject to descriptive statistics and qualitative analyses.

Variables: Outlet facilities and services	Variable type(s)		Comments
	Explanatory	Response	
Location			Nearest town and county
Type of outlet	✓		Sidai outlet, agrovet, other (pharmacy or duka)
Number of branches			Similar outlets owned by the same person or company
Services offered		✓	Livestock services and training
Number of other outlets in the town/village			Indication of competition
Effects of competition on business			Perceived constraints or benefits of other outlets
Ranking of most frequent types of customers			Customers categorised in terms of their primary livelihood
Average number of customers per day			On market and non-market days
Ranking of reasons for customer visits			In terms of services and products sought, and frequency
Product availability		✓	Problems encountered with drug supply from distributors
Access to a fridge and storage problems		✓	For vaccines and chilled medicines
Variables: People			
Size and composition of the workforce		✓	Number of staff and their roles; presence of trained personnel
Owner presence and qualifications		✓	Availability of the owner at the outlet
Role(s) of respondent		✓	Categorised in terms of job/qualifications
Experience of respondent		✓	Including current and previous roles in veterinary drug sales
Guidance or training received on drug dispensation by respondent		✓	Including training courses and staff support
Problems and constraints			Constraints to delivering a good service
Access to radio, internet and phones			Including use of social media
Willingness to receive follow-up call/information			To explore interest in further education

2.2.2 Analysis

The data were transferred to a Microsoft® Excel® for Mac 2011 (Microsoft Corporation) database, and a responses were coded as nominal or ordinal variables. For quantitative analysis, the response variables shown in Table 1 were calculated as proportions of outlets by outlet type. Confidence intervals of these proportions were calculated and plotted to allow the observation of overlap, with

non-overlapping confidence intervals indicating a significant difference between the proportions, at a 95% level of significance (Schenker and Gentleman, 2001; Payton *et al.*, 2003). ‘Other’ outlets were excluded from statistical analyses due to the small sample size obtained for these outlets (n=6). A descriptive analysis was performed on other variables.

2.3 Farmer focus group discussions

Farmer focus group discussions were conducted in Embiti, a pastoral village 4km from the town of Naikarra, and Kabiemit, a dairy-farming town in Nandi County. Twelve herders, all male, were willing to participate in the pastoralist focus group and were invited to discuss animal-health services in their area. The two-hour discussion in Maasai was guided using a semi-structured questionnaire and participatory techniques including mapping and ranking exercises (Catley *et al.*, 2008). Twenty participants (15 men and five women) were willing to participate in the dairy farmers’ focus group and were invited to discuss animal-health services in their area. All participants were members of the Kabiemit Cooperative Society, a supplier of Brookside Dairy Limited. The two-hour discussion was guided using a semi-structured interview, in the local language Kalenjin. A semi-structured interview (Bryman, 2015) was purpose-designed for each of the focus groups, modified from the framework described by Catley *et al.* (2008). The information collected during the farmer focus group discussions were analysed descriptively.

3. Results

3.1 Facilities and services

Most of the animal-health outlets visited during this study represented small businesses with on average less than two outlet branches. Two of the Sidai franchisees owned four branches each, representing the largest enterprises sampled. The questionnaire identified features of the facilities and services offered by each outlet, as indicators of quality and capacity of the outlet. Table 2 shows

the proportion of outlets, by type, offering livestock services. The type of animal-health outlet (Sidai outlet or agrovets) was explored as an explanatory factor. The proportions with 95% confidence intervals are displayed in Figure 2. ‘Clinical services’ were described as the provision of veterinary examinations and treatments to animals by outlet staff, either on the premises of the outlet, or remotely at the livestock holding, both of which were offered by many of the outlets. One-hundred percent of Sidai outlets provided clinical services, compared to 56% and 0% of agrovets outlets and other outlets, respectively. Fifty percent of Sidai outlets and 28% of agrovets had access to a refrigerator for the storage of vaccines and chilled medicines. One third of the ‘other’ outlets had access to a refrigerator. Sixteen of the 40 respondents cited their lack of a refrigerator as a storage constraint, which prevented many of them from selling vaccines. Some of these respondents still sold vaccines, but these were sold on the day of purchase from the distributor and stored in cool boxes. Some respondents attributed their lack of a refrigerator to insufficient funds to cover the capital cost, and others commented that they had no reliable means of powering the refrigerators. Two Sidai franchisees shared a refrigerator with the local doctor or hospital, which allowed them to share the capital expenditure and running costs but limited their storage capacity and access to the medicines. Four of the 40 respondents commented that lack of space was a constraint to drug and product storage. One respondent commented that the storage and sale of injectable drugs was a challenge because injectable drugs must be legally stored in closed cupboards with solid doors. The interviewee noted that “*pastoralists only buy what they can see*”, and illiterate herders recognise the outer packaging of the drugs displayed on open shelves.

Table 2: The proportions of animal-health outlets offering livestock services with 95% confidence intervals (CIs), by type.

Service offered	Proportion of animal health outlets (with 95% CIs)		
	Sidai outlets	Agrovets	Other outlets
Clinical services	100% (79-100)	56% (31-78)	0% (0-46)
Vaccinations	81% (54-96)	39% (17-64)	0% (0-46)
Disease reporting/Surveillance	94% (70-100)	61% (36-83)	0% (0-46)
Artificial insemination (AI)	38% (15-65)	22% (6-48)	0% (0-46)
Diagnostic testing	25% (7-52)	6% (1-27)	0% (0-46)
Farmer training	100% (79-100)	83% (59-96)	50% (12-88)

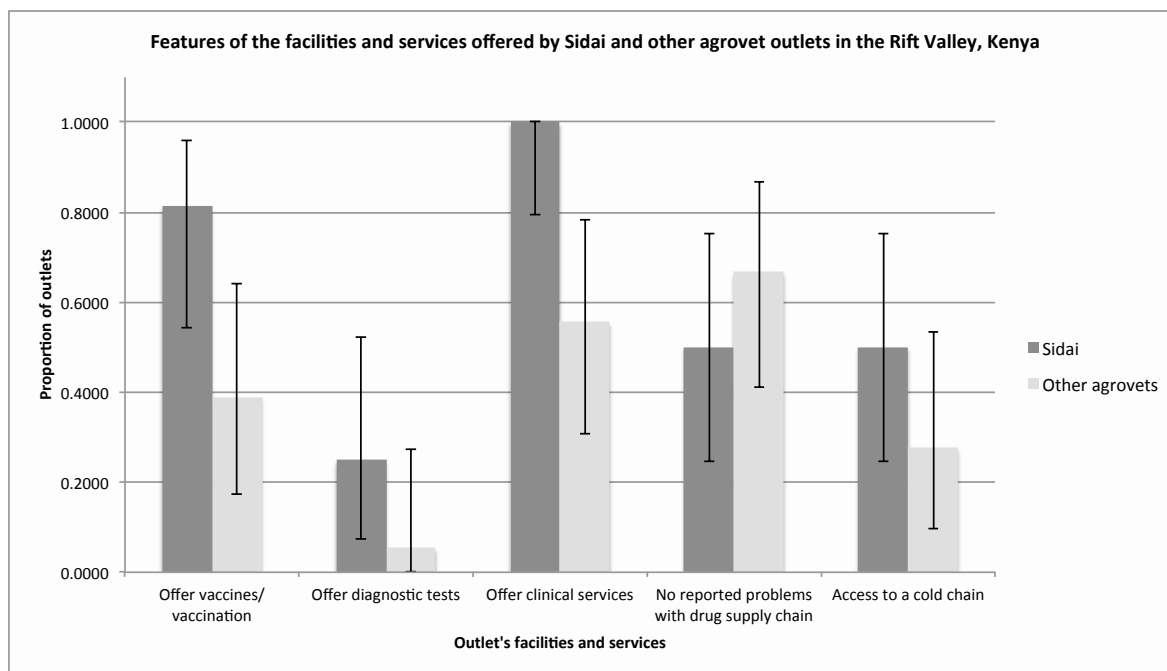


Figure 2: The proportions with 95% confidence intervals of Sidai outlets (n=16) and agroverts (n=18) in the Rift Valley of Kenya with characteristics relating to their facilities and services as indicators of their quality and capacity.

The interviewees were asked to rank the reasons for customers visiting their outlet from nine options in decreasing order of frequency, from one (most common) to nine (least common). The five most common reasons are shown in Figure 3. The respondents were asked to estimate the average number of customers visiting their outlet per day for services or products on non-market days and market days (if applicable). The median number of customers stated was 20, 30 and 20 for Sidai outlets, agroverts and ‘other’ outlets, respectively. On market days, median estimations of 80 customers visited Sidai outlets and 60 visited agroverts.

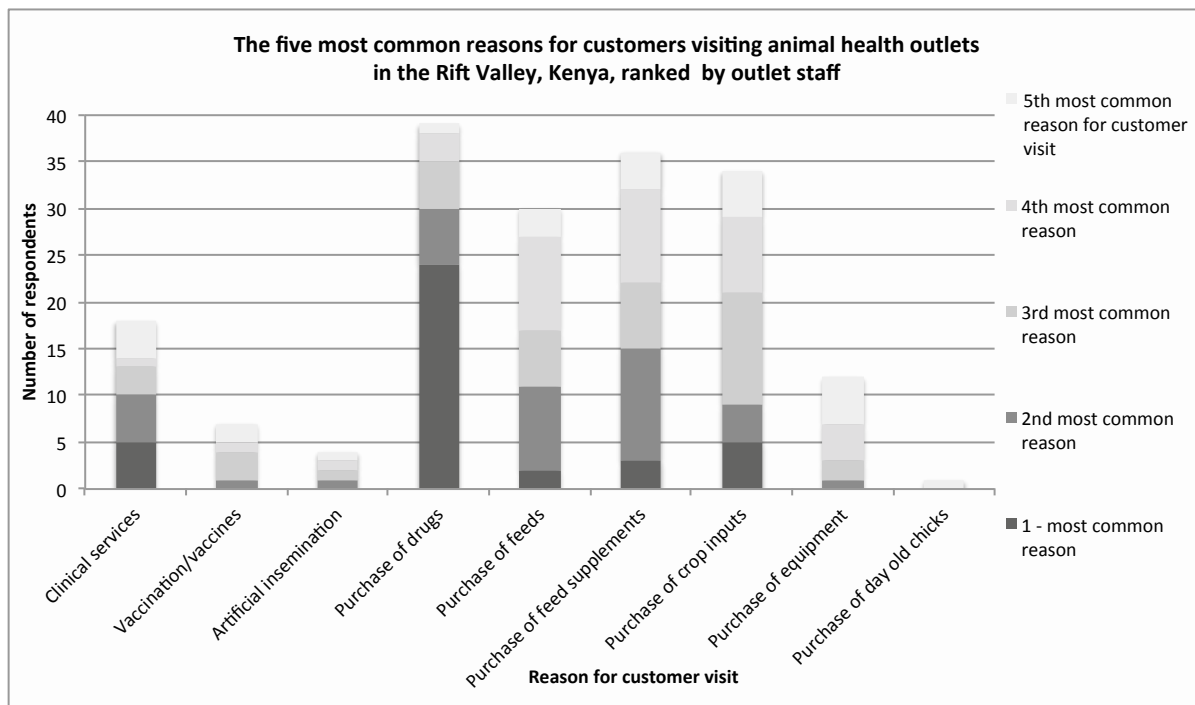


Figure 3: The five most common reasons for customer visits to animal-health outlets in the Rift Valley, ranked by outlet staff. (y-axis indicates the number of respondents stating the choice).

The respondents were asked to estimate the number of animal-health outlets in their town, and numbers ranged from two in the smaller towns such as Kipsigak, to 50 in Eldoret. Eighty-eight percent of Sidai respondents, 56% of agrovet staff and 83% of ‘other’ outlet staff cited competition with other drug vendors as a problem to their business. Reasons stated included price undercutting and unfair competition from vendors of cheap substandard medicines. Two agrovet respondents claimed that the other animal-health outlets in their town had a positive effect on their businesses, providing an “*opportunity to compete*”.

3.2 Workforce

‘Animal-health professionals’ were defined as qualified veterinary surgeons and paraprofessionals (animal-health assistants) according to the Veterinary Surgeons and Veterinary Paraprofessionals Act (National Council for Law Reporting, 2012). ‘Technically trained personnel’ for the purpose of this study were defined as those with animal-health or medical training, and include veterinary surgeons,

animal-health workers, community animal-health workers, artificial insemination (AI) technicians and pharmacists. The average composition of the workforces according to outlet type (Sidai outlet, agrovet or other) can be found in Table 3. The type of animal-health outlet (Sidai outlet or agrovet) was explored as an explanatory factor for the quality and capacity of the outlet in terms of the training and experience of their employees. The proportions with 95% confidence intervals are displayed in Figure 4.

Table 3: The average composition of the workforce at animal-health outlets in the Rift Valley, by outlet type.

Roles of staff	Staff roles as percentages of the workforce, by outlet type		
	Sidai outlets	Agrovets	Other outlets
Vets	16%	4%	0%
Animal health assistants	43%	36%	0%
CAHWs	4%	2%	0%
Pharmacists	2%	0%	29%
AI technicians	6%	16%	0%
Laboratory staff	0%	0%	0%
Shop attendants	29%	42%	72%

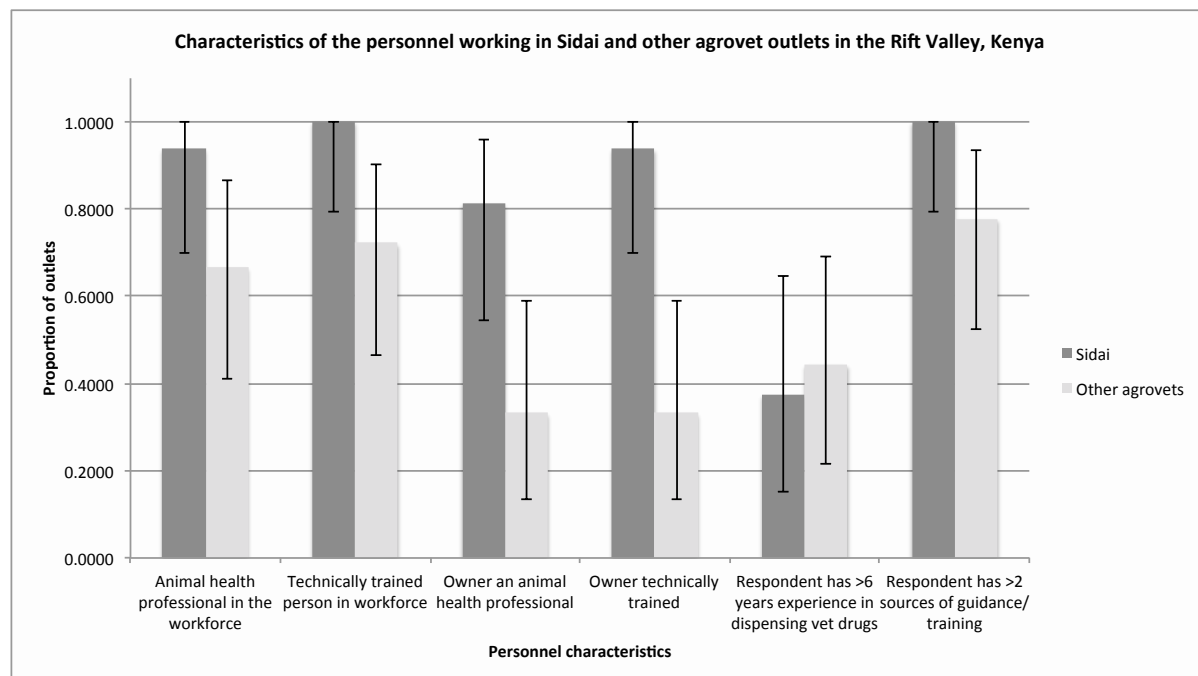


Figure 4: The proportions with 95% confidence intervals of Sidai outlets (n=16) and agrovet (n=18) in the Rift Valley of Kenya with characteristics relating to their workforce, as indicators of their quality and capacity.

3.2.1 Training

Respondents were asked to select from a list of options the training and guidance they had received in veterinary drug supply, as an indicator of outlet quality and capacity. The results are presented in Figure 5, by type of outlet.



Figure 5: The proportion of respondents receiving training and guidance in veterinary drug dispensation of different forms, by outlet type, with 95% confidence intervals.

3.2.2 Constraints and intervention points

In order to identify the demand from animal-health outlet staff for training, the respondents were asked if they would be willing to receive a follow-up call or information on future training events. Thirty-eight of the 40 respondents (95%) agreed. To explore possible methods for providing information and extension materials to outlet staff, the respondents were also asked if they had access to, and used a number of, communication media, including radio, television, the internet, social media sites and a mobile phone. The results are shown in Table 4.

Table 4: Proportions of animal-health outlet staff in the Rift Valley, Kenya, with access to different media for communication.

Media	Respondents with access	
	Total number	Percentage
Radio	40	100%
TV	33	83%
Internet	37	93%
Social media	36	90%
Mobile phone	40	100%

Respondents were asked to describe any challenges that they face in providing a quality service to customers. Table 5 displays the challenges stated by the respondents in order of frequency of the observation.

Table 5: The challenges in providing a quality service to customers cited by animal-health outlet staff in the Rift Valley, Kenya.

Challenges	Number of respondents citing the challenge
Strong farmer preferences for the same familiar products and reluctance to try new or different products	6
Insufficient capital for equipment or restocking	5
Ignorance of farmers, who prefer cheaper drugs	4
Transport difficulties in accessing remote clinical cases	4
Customer drug compliance (e.g. farmers sometimes increase the dose to try and increase efficacy of a product)	3
High prices of drugs from distributors (e.g. therefore cannot afford a large product range)	3
Poor availability of quality drugs from distributors	3
Farmers ask for credit (e.g. and sometimes don't repay)	3
Farmers bargain for a lower price for drugs due to competition	3
Language barriers with customers (local languages)	3
Customer demand for certain drugs affected by radio adverts (e.g. difficult to keep a constant supply of the new products advertised)	2
Lack of a cold chain/fridge	2
Loss of useful products from the market, such as a triclabendazole-based product	2
Competition	2
Stock-outs from the distributors	2
Illiterate customers	2
Presence of untrained animal service providers	1
Poor quality medicines available from other outlets, and owners are unable to differentiate them	1
Lack of laboratory facilities	1
Lack of different feed varieties	1
Lack of crop chemicals	1
Drought - when farmers are affected, it affects sales	1
Price fluctuations affect buying habits	1
Lack of training	1
Sometimes too busy to provide a good service to all customers	1

3.3 Farmer focus group discussions

3.3.1 Maasai pastoralist discussion group

The Maasai pastoralist group listed the local Sidai outlet, two agrovets and ethnoveterinary practitioners as the options available to them for the treatment of sick animals. The Sidai outlet and agrovets were visited if their sick animals failed to respond to ethnoveterinary remedies. The local Sidai outlet was located a 3-4 hour walk from the pastoralist settlement. It was ranked higher than the agrovets and ethnoveterinary practitioners in terms of the quality of drugs offered, the response to disease outbreaks, communication with the pastoralists in the local language and the provision of credit for drugs and services. Ethnoveterinary treatments, however, were preferred by the group in terms of affordability. The pastoralist group agreed that both livestock production and access to veterinary drugs and animal health services had improved since the Sidai outlet had opened in the area two years previously. The group felt constrained by the lack of quality advice on drug use and the lack of drug storage space in their village.

3.3.2 Dairy cooperative focus group

The dairy farmer cooperative group listed the local Sidai outlet, agrovets and traditional first aid as the options available to them for the treatment of sick animals. The Sidai outlet and agrovets were visited or veterinary surgeon called if their sick animals failed to respond to traditional first aid. The local Sidai outlet was ranked higher than the agrovets in terms of the competence of their staff, the provision of training and veterinary product availability. Agrovets, however, were preferred by the group in terms of efficiency, as they are located closer to the farmers' village, and affordability. The dairy farmer group agreed since the dairy cooperative had entered in to a partnership with Sidai, they have had access to higher quality medicines and a beneficial cash-free system of payment, with veterinary costs deducted from their milk payments.

4. Discussion and conclusions

4.1 Facilities and services

Private animal-health services offered in the Rift Valley of Kenya are delivered by a large number of outlets of various types, including Sidai franchises, Sidai hubs, agrovets, mixed human-animal pharmacies and 'dukas'. Most of the animal-health outlets visited during this study represented small businesses with on average less than two outlet branches. The absence of larger chains of animal-health outlets in the region suggests a limit to the scalability of these businesses. Despite the large number of outlets operating at some of the study sites, poor access to animal-health services in rural remote regions in sub-Saharan Africa remains a key constraint to animal-health, and both groups of farmers participating in this study reported problems with accessing animal-health services. Amongst the dairy farmer group, access to Sidai's services was considered difficult due to the distance of the nearest Sidai outlet to their village.

Access to refrigeration is an important element of veterinary service delivery, according to the Terrestrial Animal Health Code (OIE, 2014a). Overall, 38% of animal-health outlets had access to a refrigerator. A greater proportion of Sidai outlets had access to a refrigerator than agrovets, but the confidence interval overlap technique did not indicate a significant difference between the proportions. Animal-health outlets with access to a cold chain included those that owned a refrigerator, and two Sidai franchises and one agrovet that shared refrigerator space with their local medical centre. Some clinics without access to a refrigerator used cool boxes to transport vaccines from their local distributor, and sold or administered the vaccines on the same day. Although these solutions in part overcome the lack of refrigerators, vaccine coverage is still restricted by the widespread lack of access to cold chains and thus remains a key constraint to animal-health services. Reasons for not owning a refrigerator included insufficient finances to purchase a refrigerator or fuel, lack of electricity and unreliable electricity supply.

A number of storage challenges were reported, including a lack of space to store drugs, drug expiry and customer purchasing behaviour necessitating the visible display of available drugs in a small shop space. Injectable products must be stored in closed cupboards by Kenyan law, therefore the sale of these products was considered difficult by one respondent because of a prevalence of illiterate farmers who tend to select their favoured products through recognition of packaging. During the Maasai pastoralist focus-group discussion, it was noted that farmers felt constrained by a lack of their own drug storage space and lack of a refrigerator in the local village, voicing their concerns about risks of drugs to their children, who currently have easy access to the medicines.

There was a notable difference between the range of services offered by outlets of different types. One hundred percent and 56% of Sidai and agrovets offer clinical services, respectively, with a significant difference observed between these proportions. None of the ‘other’ outlets (pharmacies and dukas) offered clinical services. The availability of a clinical service is a vital aspect of comprehensive veterinary services, allowing contribution to animal-health decision-making and professional intervention. In contrast, staff from animal-health outlets that *do not* offer clinical services have little involvement in the diagnostic process, and may not have any practical experience in animal-health care. In these cases, farmers are the primary agents in the selection and delivery of treatments to livestock, and these findings support previous observations by Leonard *et al.* (1999) of a disconnection between the sale of veterinary medicines and the provision of quality advice. Studies have demonstrated the diagnostic skill and knowledge of livestock diseases and treatments amongst farmers and pastoralists (Grace *et al.*, 2009; Jandreau and Berkes, 2016); however Grace *et al.* (2009) also highlighted the potential for poor administrative practices and high proportions (24%) of injection-related side-effects following farmer treatments. These studies support the need for a level of intervention by trained personnel, which was found to be frequently lacking in the current study.

Vaccinations represent a vital tool in preventive livestock health care, and are an important aspect of a comprehensive veterinary service. Eighty-one percent of Sidai outlets offer vaccines for sale or vaccination services, compared with 39% and 0% of agrovets and 'other' outlets, respectively. Considering the low proportions of outlets with access to a cold chain, it is likely that the widespread lack of refrigerator access is a key reason for low vaccine coverage.

A greater proportion of Sidai outlets also provided disease reporting to the government, artificial insemination services, diagnostic testing and farmer training. The dairy-farmer group stated that the local Sidai outlet was the only service provider to offer farmer training in the area. The difference in the percentage of Sidai outlets and agrovets offering diagnostic testing was not statistically significant using the confidence-interval overlap technique, and, overall, these proportions were low because of a lack of diagnostic-laboratory facilities and cost-effective tests, indicating that empirical drug choices prevail. A greater proportion of Sidai outlets offered each service listed in the questionnaire compared with agrovets and 'other' outlets, the latter of which offered no services other than informal farmer training at the point of drug sale. Fifty percent of Sidai outlet respondents and 67% of agrovet staff reported no problems with their drug supply chain. Those that did report problems with the supply chain claimed that delays and stock shortages at the suppliers were frequently experienced.

The estimated average numbers of customers visiting the Sidai outlets and the agrovets per day were similar. Drug purchase was cited as the most frequent reason for customer visits at 60% of all outlets. This prevailing drug purchasing behaviour by farmers indicates a disconnection between animal-health outlet workers and clinical cases, with farmers acting as the primary animal-care provider. However, the frequency of drug sales demonstrates that farmers are able and willing to frequently purchase medicines for livestock where services exist, consistent with other studies (Heffernan and

Misturelli, 2002). In addition, the point at which drugs are purchased represents an intervention point for improving animal-health care practices.

Competition with other outlets was cited as a problem at the majority of outlets visited, with only two respondents perceiving this competition to be beneficial to business. Impacts of competition included price undercutting and unfair competition from vendors of cheap substandard medicines. The observation that a greater proportion of Sidai respondents than agrovets cited competition as a problem implies that the Sidai outlets are not undermining the businesses of local agrovets. This may be due to the fact that only one Sidai outlet usually operates in each town.

Differences were observed between the Sidai outlets and agrovets in terms of the quality and capacity of their personnel. The indicators used to characterise the staff at the animal-health outlets included the presence of animal-health professionals and technically-trained personnel in the workforce, ownership of the outlet by an animal-health professional or a technically-trained person, and the provision of at least two sources of training or guidance to staff members in dispensing drugs. The questionnaire revealed that a greater proportion of Sidai outlets than agrovets had animal-health professionals and technically-trained personnel in their workforce, were owned by professionally-trained or technically-trained personnel, and provided at least two forms of training or guidance to staff. A statistically significant difference, using the confidence-interval overlap technique, in the proportion of outlets with technically trained owners between Sidai outlets and agrovets was observed. There was a slightly higher proportion of agrovets than Sidai outlet respondents with more than six years of experience in dispensing veterinary drugs. Overall, these results suggest that Sidai outlets tend to have a workforce of greater technical competence than agrovets, but a larger sample size would be required to increase the statistical power of these results. The outcomes of the farmer focus groups reinforce these findings. Staff at the local Sidai outlet were

reported by the Maasai group to have better communication skills (in the local language) and to provide a quicker response to emergencies than the local agrovets. The local Sidai outlet was preferred to the agrovets by the dairy cooperative group in terms of the clinical competence of its staff; however, due to the distance of the Sidai outlet from the dairy farmers' village, they ranked the other agrovets as preferable in terms of efficiency. A larger number of focus groups would be required to explore farmer perceptions in different villages.

The average composition of the workforce was assessed by outlet type. On average, 59% of the workforce at Sidai outlets is composed of animal-health professionals, compared with 40% of staff at agrovets and 0% at the 'other' outlets sampled. Artificial insemination technicians comprise the greatest proportion of the workforce at agrovets (16%), and pharmacists comprise the greatest percentage of staff at the 'other' outlets sampled (29%). Unqualified shop attendants comprise 72% of the workforce at 'other' outlets, 42% at agrovets and 29% at Sidai outlets. Overall, these data suggest that Sidai outlets tend to employ a higher proportion of professional personnel than agrovets and 'other' outlets, but a higher proportion of non-professional but trained technical staff can be found at agrovets than at Sidai and 'other' outlets. At the 'other' outlets sampled, the sale of animal-health products by staff is undertaken without any apparent animal-health training, and veterinary medicines are offered as part of a diverse portfolio of products. Considering the potentially large number of pharmacies and dukas selling veterinary medicines across Kenya, the lack of training of their staff is concerning and could represent a key constraint to the effective and responsible deployment of veterinary medicines. However it should also be acknowledged that these outlets play a key role in the management of livestock health in underserved areas (CTVM, 2002), and therefore there is a need to recognise, regulate and support these outlets in their provision of services.

Sidai outlet respondents most commonly cited access to books and materials (94% of respondents) and training courses (94% of respondents) as their sources of training and guidance in dispensing drugs. Agrovét staff most frequently selected training courses (67% of respondents) mainly offered by drug companies, and ‘other’ outlet staff most frequently selected information from drug companies (50% of respondents) as their source of training or guidance. This information suggests that most Sidai outlet staff have access to unbiased information on veterinary treatments, and most agrovét and ‘other’ outlet staff have access to information and training that is likely to promote the marketed products of pharmaceutical companies. This reveals a significant and concerning gap in impartial training provision for agrovét and ‘other’ outlet staff, on the informed and responsible dispensing of veterinary drugs to customers.

Ninety-five percent of respondents were receptive to the prospect of future training, stating that they were willing to receive a follow-up call and information about training opportunities. One hundred percent of all respondents had access to a radio, 83% had access to a television, 93% used the Internet, 90% used social media (including Facebook, WhatsApp and Twitter) and 100% owned a mobile phone. All of these communication media offer a vehicle for disseminating training and extension materials, and the potential to form an online community of animal-health service providers. Social media and mobile phones in particular offer a medium for disseminating online and podcast training courses and support to animal-health staff working in remote areas.

The respondents reported a large number of constraints in their delivery of a quality service. The most frequently cited challenges included strong farmer preferences for certain products (by six respondents), financial constraints (five respondents), farmer “ignorance” (four respondents), and transport difficulties that restrict access to clinical cases in remote areas (four respondents). Customer behaviour and difficulties in communicating with customers accounted for 11 of the 25

problems mentioned by the respondents. The remaining challenges related to external factors such as the limited availability of quality drugs, infrastructure and competition, and financial difficulties restricting their range of stock and purchase of capital equipment such as refrigerators. These issues highlight the importance of both farmer and outlet staff training, and the relationship and communication between the community and the animal-health outlet personnel. Farmer choice emerged as a key factor in veterinary drug use and livestock treatments, which in many cases bypasses the knowledge and advice of the animal-health outlet staff. The conflict of interest of private practitioners between responsible drug use and drug sales (Bardosh *et al.*, 2013) is one of the challenges in the veterinary post-privatisation era, and could be acknowledged and mitigated through farmer and outlet staff training and regulation. In addition, greater clarity on drug indication and correct use is required from drug companies, with the needs of the local communities reflected in the form of extension materials and tools produced.

A number of impacts of animal-health services on the local community were agreed during the farmer focus discussion groups. These impacts included improved animal-health and productivity, increased income enabling farmers to pay school fees, improved child health, improved standard of living, and increased “technical know-how” of the farmers. Both groups agreed that the opening of a Sidai outlet in their locale had produced a positive impact on their communities.

This study identifies a number of opportunities and constraints within the private animal-health system in the Rift Valley of Kenya. The opportunities lie within the extensive and diverse network of animal-health outlets in operation in the region, with a demand from livestock keepers for accessible, affordable and quality services and products. However, these service providers and their customers face a number of significant challenges, and the Sidai franchise model offers a means of addressing these issues in a challenging policy environment by maintaining a high-quality workforce with

professional oversight and a broad service portfolio, and providing farmer training. Notwithstanding the identified constraints across all outlet types, private animal-health practitioners in Kenya have the potential to provide increased support to livestock-based livelihoods.

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6. Ethical statement

Ethical approval was sought from the contributing organisations and from local institutions for conducting this study. This study was conducted alongside the NGO Sidai Africa Ltd, and interviews and focus group sessions were conducted with consenting Sidai staff and customers, and staff members at neighbouring shops.

7. Conflict of interest statement

There are no conflicts of interest to declare.

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